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The genus *Kovalenskiella* Klein, 1963 from the ground waters of Greece, with description of *Kovalenskiella dani*, spec. nov., and a key to world recent species

(Crustacea, Ostracoda, Limnocytheridae)

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In the present paper a new species, *Kovalenskiella dani*, spec. nov. is described and *Kovalenskiella rudjakovi* (Danielopol, 1969) and *K. bulgarica* (Danielopol, 1970) are redescribed. All species were collected in the subterranean waters of Greece. The new species differs from all other described recent species by the chaetotaxy of mandibula. Together with the new species, the genus *Kovalenskiella* now contains a total of five recent and four fossil species. A key to the world recent species is provided.

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Introduction

The recent freshwater ostracod fauna of Greece is generally very poorly known. The only exception is the ostracod fauna of the Corfu Island, which is well known mainly through the work of Stephanides (1937, 1948, 1960, 1964a,b), and Klie (1936). Data about ostracods from other Greek regions are rare (Klie 1941, Schäfer 1945, Danielopol 1979, 1981, Petkovski & Keyser 1992), as no systematic investigation of the ostracod fauna has ever been undertaken in this country. Despite this, the following 14 species were described from the Greek inland waters (alphabetical order, by original generic designation): *Candona peliaca* Schäfer, 1945, *C. pseudocrenulata* Schäfer, 1945, *C. spelea* Klie, 1941, *Candonopsis thienemanni* Schäfer, 1945, *C. trichota* Schäfer, 1945, *Cyclocypris scrobiculata* Klie, 1936, *Cypria inversa* Klie, 1941, *Eucypris elongata* Stephanides, 1937, *E. kerkyrensis* Stephanides, 1937, *Kliella hyaloderma* Schäfer, 1945, *Leptocythere ostrovskensis* Petkovski & Keyser, 1992, *Nannokliella dictyoconcha* Schäfer, 1945, *Physocypria kerkyrensis* Klie, 1936, and *Pseudolimnocythere hartmanni* Danielopol, 1979. The majority of the mentioned species, as well as the genera *Kliella* Schäfer, 1945 and *Nanokliella* Schäfer, 1945, are endemic to Greece. The number of species described from the subterranean waters (all above mentioned, except two species of the genus *Eucypris*, *Cypria inversa*, *Cyclocypris scrobicula*, *Leptocythere ostrovskensis*, and *Physocypria kerkyrensis*) suggests that karstic systems of Greece may contain more undescribed ostracod taxa. The results presented here support such a claim and provide encouragement for further investigation of these habitats.

The present paper deals with some of the ostracod species collected during intensive sampling of the subterranean fauna of Greece (mainly from wells) by Prof. Giuseppe L. Pesce and his colleagues; copepods collected in these samples have already been published (Pesce 1985, Pesce & Maggi 1983, Pesce et al. 1979). While other results concerning ostracods will be published elsewhere, here we are presenting species of the genus *Kovalenskiella*, i.e. one new spe-

cies and two previously known but new for the ostracod fauna of Greece. Also, a key for identification of the world recent species is provided.

Four recent species of the genus *Kovalenskiella* Klein, 1963 have been described until now: *K. phreaticola* (Danielopol, 1965), *K. cvetkovi* (Danielopol, 1969), *K. rudjakovi* (Danielopol, 1969), and *K. bulgarica* (Danielopol, 1970). All these species were described in the genus *Cordocyhtere* Danielopol, 1965, and subsequently (Danielopol 1971, 1980, Colin & Danielopol 1980) transferred these to the genus *Kovalenskiella*. *K. rudjakovi* was named by Danielopol (1969) on the basis of Rudjakov's (1963) description of *Metacypris sp.* from Transcaucasia, while others were described after original material from Bulgaria and Romania (Danielopol 1965, 1969, 1970). There are also four fossil species in the genus: *K. turianensis* Klein, 1963, *K. caudata* (Lutz, 1965), *K. prima* (Carbonnel & Ritzkowsky, 1969), and *K. euboeaensis* Mostafawi, 1994. Much has been written about the geological history and biogeography of the genus *Kovalenskiella* (see Danielopol 1980, Colin & Danielopol 1980). In brief, today all living species are confined to the subterranean environment of southern Europe, while their ancestors (from the same genus) had a wider distribution in the surface waters of Europe.

Material and Methods

Samples were collected using a modified Cvetkov net (Cvetkov 1967), mesh size 0.05 mm, and preserved in 4 % neutralized formalin. Animals were later sorted in the laboratory under a stereo microscope Wild M8, and transferred into a solution (10:1) of ethanol and glycerol. Unfortunately, due to glycerol, carapaces of all ostracods were completely decalcified, and difficult to handle.

Ostracods were dissected in an equal mixture of distilled water and glycerol with fine entomological needles (mark 000), under stereo microscope MBS-10. Dissected appendages were mounted in Faure's medium. Carapaces, although completely decalcified, were mounted also in the drop of the Faure's medium on the same slide with appendages. Drawings have been prepared using a drawing tube attachment on Leica-DMLS microscope, with C-PLAN achromatic objectives. All material is deposited in the Western Australian Museum (WAM).

In the systematic part of this paper the length of all segments is measured in the middle of the segments, and length ratios are presented beginning with the proximal end. No abbreviations are used in text and figures.

Results

Family Limnocytheridae Sars, 1925
Subfamily Timiriaseviinae Mandelstam, 1960
genus *Kovalenskiella* Klein, 1963

Kovalenskiella bulgarica (Danielopol, 1970)
Figs 1-13

Cordocythere bulgarica, n. sp. – Danielopol (1970): 288, figs 2C, 4C, Tab. 1.

Kovalenskiella bulgarica (Danielopol, 1970) – Danielopol (1980): 246, Tab. 2; Colin & Danielopol (1980): p. 24, Tab. 2.; Fig. 2 (I-J); Plate 3 (1-9); Plate 4 (1-3).

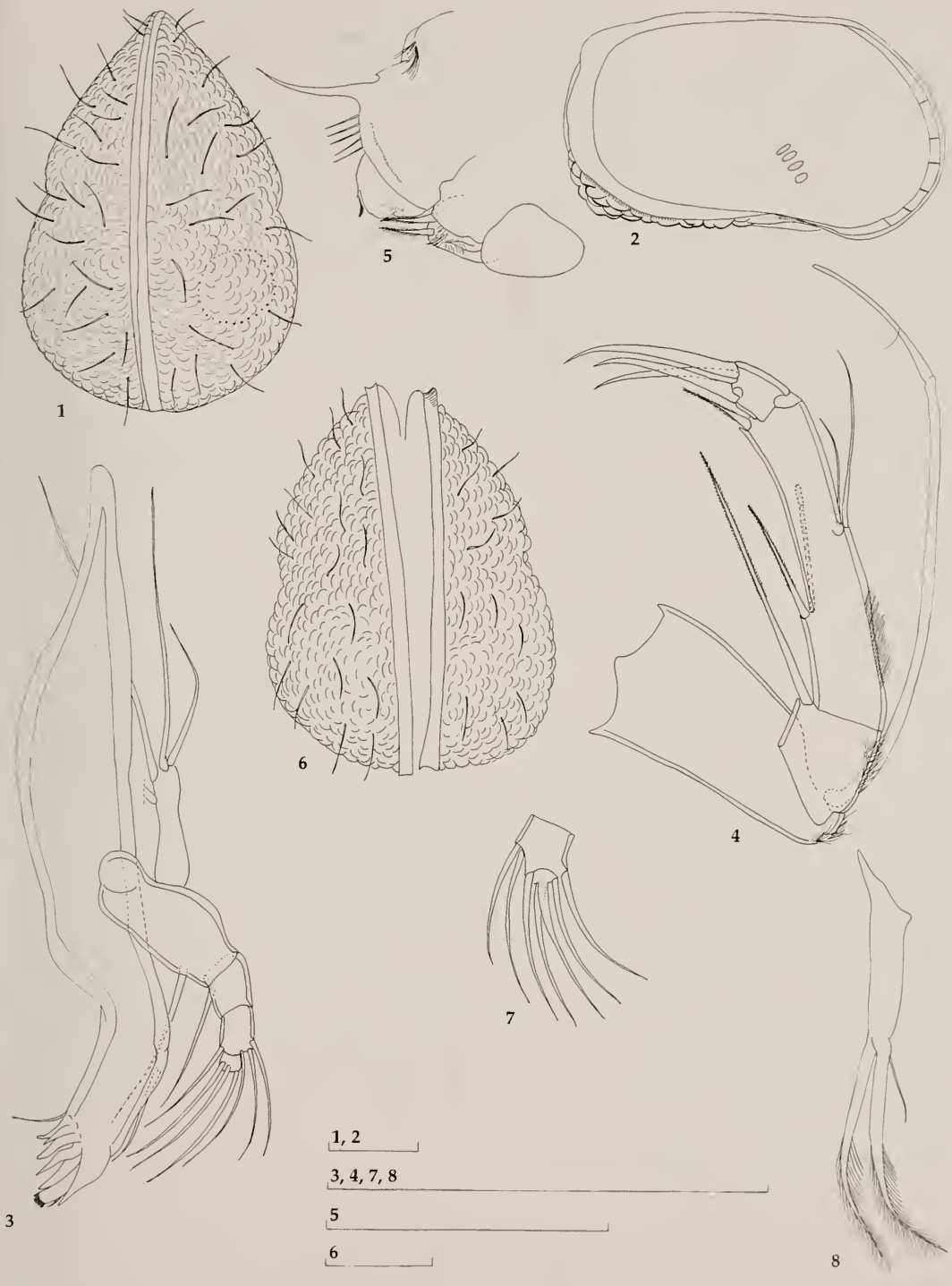
Kovalenskiella bulgarica, n. sp. – Colin & Danielopol (1980): p. 22, Tab. 1.

Material examined. 1. One ovigerous ♀ (WAM C28370) from a nameless freshwater well in the village of Perdika near the town of Igoumenitsa, Epirus, Greece, February 28, 1975, collected by R. Argano & G. L. Pesce; 2. One ovigerous ♀ (WAM C28371) from a nameless freshwater well near the town of Ioanina, Epirus, Greece, February 23, 1976, collected by G. L. Pesce.

Redescription

Female. Length 0.37-0.43 mm. Greatest height situated on last third, equalling about 53 % of length. Greatest width, on caudal end, equalling 70 % of length. In lateral view (Fig. 2) dorsal margin straight, on all its length, then with almost right angle passing into posterior margin, while inclined towards anterior margin. Depending on animal position in lateral view, hump visible on last third. Both anterior and posterior margins rounded, ventral margin concave around mouth area. Line of concrescence narrow and with just several straight canals. Flange small but developed on anterior end of left valve. In dorsal view (Fig. 1) shell oviform with clear sulcus in middle. Anterior end pointed, posterior end widely rounded, and with breeding cavity. Surface strongly sculptured and covered with relatively dense and stiff, rather thorn-like setae. Hinge, as in other representatives of genus, inverse lophodont, right valve clearly overlapping left one dorsally, anteriorly, posteriorly and ventrally.

Antennula (Figs 9, 13). 6-segmented. First segment without any seta, second with one seta situated postero-medialy. Third segment with one seta antero-distally, which is pappose and reaches the middle-length of fifth segment. Fourth segment with one (Fig. 13), or two (Fig. 9) setae antero-distally, of which one pappose seta exceeds the distal end of following segment and the other, if present, reaches the distal end of terminal segment. Penultimate segment with altogether four setae: one smooth seta posteriorly (about 2.5× as long as penultimate seg-



Figs 1-8. *Kovalenskiella bulgarica* (Danielopol, 1970). **1-4.** ♀, WAM C28370 (length 0.37 mm). **5-8.** ♀, WAM C 28371 (length 0.43 mm). **1.** Carapace, dorsal view. **2.** Left valve, internal view. **3.** Mandibula. **4.** Antenna. **5.** End of the body with furca. **6.** Carapace, ventral view. **7.** Subterminal and terminal segments of mandibular palp. **8.** Maxillular palp. Scales = 0.1 mm.

Figs 9-13. *Kovalenskiella bulgarica* (Danielopol, 1970). **9-12.** ♀, WAM C28370 (length 0.37 mm). **13.** ♀, WAM C28371 (length 0.43 mm). **9.** Antennula. **10.** Third walking leg (terminal claw slightly rotated). **11.** First walking leg. **12.** Second walking leg (endopodal segments rotated). **13.** Antennula. Scale=0.1 mm.

ment); two smooth setae anteriorly (one of same length as posterior seta, the other slightly longer), and one pappose seta anteriorly (just exceeding terminal segment). Terminal segment with three "normal" setae (one, situated most posteriorly, being longest, the other two situated more anteriorly, of about same length, and slightly less than double shorter than the posterior one), and with aesthetasc which are fused at proximal end with one of the anterior setae, being 3.2× as long as terminal segment. Length ratio of six segments 4.1:3.6:1.5 :1:1.7:1.25. Anterior margins of almost all segments (except third) with row of hairs.

Antenna (Fig. 4). 3-segmented. Exopodite long, exceeding distal end of terminal segment. First segment without any seta. Second segment with one long (almost reaching distal end of following segment), and pappose seta posteriorly. Third segment with one pappose seta and aesthetasc (equally long, and not reaching distal end of same segment) situated postero-medially, and two setae antero-medially (both being smooth, one slightly exceeding distal end of third segment, the other not reaching distal end of same segment). Same segment with one pappose seta postero-distally, which is almost 2× as long as terminal segment. Terminal segment with 3 claws of subequal length (about 2 to 2.2× as long as terminal segment). Length-width ratio of penultimate segment 4.4:1, length ratio of three endopodal segments 2.1:7:1. Anterior margins of first three segments with bunches of hairs.

Mandibula (Fig. 3). Exopodite with four setae. Coxa with about seven teeth. Mandibular palp consists of four segments. First and second segmants bearing one seta each on the inner side of appendage. Third segment with one seta internally and three setae externally. Terminal segment very small and with 3 terminal setae. All setae on mandibular palp smooth. Length ratio of segments on palp 11:3.3:3.3:1.

Maxillulla with aberrant seta on branchial plate. Exopodiate with about 11 pappose setae. Maxillular palp (Fig. 8) consists of just one segment which distally bears two long pappose setae, and one small smooth seta situated laterally. Other maxillular endites with three to four claw-like setae. All endites elongated.

First walking leg (Fig. 11). Protopodite with two pappose setae situated antero-proximally and two pappose seta antero-distally, and one long pappose seta postero-proximally. First endopodal segment with one pappose seta antero-distally which almost reaches the distal end of following segment. Third and fourth segments without setae but distally with row of hairs. Teminal claw just 1.5× as long as terminal segment, with one posterior thin seta (hardly visible). Length ratio of three protopodal segments 1.8:1:1.

Second walking leg (Fig. 12). Protopodite with two pappose setae antero-proximally, one pappose seta antero-distally, and one pappose seta postero-proximally. First endopodal segment with one short, pappose seta (only reaching middle length of following segment) antero-distally. Anterior margin of second and third endopodal segments with row of hairs, as well as distal margin of terminal segment. Terminal claw 1.4× as long as terminal segment. Length ratio of three endopodal segments 1.9:1:1.

Third walking leg (Fig. 10). Protopodite with two pappose setae antero-proximally, one pappose seta antero-distally, and one pappose seta postero-proximally. First endopodal segment with one pappose seta antero-distally (not reaching distal end of penultimate segment). Distal margins of penultimate and terminal segments, as well as anterior margin of terminal segment with row of hairs. Terminal claw very thin distally and 1.8× as long as terminal segment. Length ratio of three distal segments 2.3:1:1.

Caudal end (Fig. 5) with one long claw-like extension, few spinules, bunches of hairs, and rows of small spines. Furca typical for genus, with two lobes which are pappose and distally terminating in a small spine (hardly visible), the third one dilated basally (on Fig 5 this lobe sticked with basis).

Male. Not known.

Variability. Although the genus *Kovalenskiella* apparently is very conservative in external morphology, both of soft and hard parts, this particular species is variable in one character. In the ♀ from Igoumenitsa, the antennula on the fourth segment has only one seta, while the opposite appendage of the same animal bears two setae at that position. The other ♀ on both antennulae has just one pappose seta on the same segment.

Distribution. At present, *Kovalenskiella bulgarica* is known from southern Bulgaria (Danielopol 1970), as well from south-western and central Greece (present records).

Kovalenskiellla rudjakovi (Danielopol, 1969)

Figs 14-32

Metacypris sp. – Rudjakov (1963): p. 32, Fig. 1.
Cordocythere rudjakovi n. sp. – Danielopol (1969): p. 138, Plate 7, Figs 39-45.
Cordocythere rudjakovi Danielopol – Danielopol (1970): 288, fig. 3 (B), Tab. 1.
Cordocythere n. sp. – Danielopol (1970): 239, Tab. 1.
Kovalenskiella sp.; Colin & Danielopol (1980): Fig. 5.

Kovalenskiella n. sp. – Colin & Danielopol (1980): Tab. 2.
Kovalenskiella rudjakovi – Colin & Danielopol (1980): p. 31.
Kovalenskiella n. sp. aff. *rudjakovi* – Danielopol (1971): p. 183. Colin & Danielopol (1980): p. 31.

Material examined. 1. One ovigerous ♀ (WAM C28372) and 1 juvenile ♀ (WAM C28373) from a nameless freshwater well in the village of Mithiinna, Lesbos Island, Greece, July 28, 1982, collected by G. L. Pesce. 2. One ovigerous ♀ (WAM C28374) from a nameless freshwater well in the village of Skoutaros, Lesbos Island, Greece, July 28, 1982, collected by G. L. Pesce.

Redescription

Female. Length of valves 0.377-0.434 mm. Greatest height situated on last third, equalling about 54 % of length. In lateral view (Figs 14, 15) dorsal margin straight on its whole length, then with almost right angle passing into posterior margin, while sharply inclined towards anterior margin. Hump visible on posterior third of length. Both anterior and posterior margins rounded, but posterior one more broadly than anterior one. Marginal zone and line of concrescence not visible due to decalcification of carapace. Selvage peripheral anteriorly. Right valve overlapping left one on anterior and posterior ends, as well as dorsally and ventrally. Hinge typical for genus. Valve surface strongly ornamented and covered with stiff, thorn like setae. Medial sulcus present.

Antennula (Fig. 17) 5-segmented. First segment without any seta, second with one long seta postero-medially. Third segment with one pappose seta antero-distally (hardly reaching middle of following segment). Fourth segment with two long and one short pappose setae antero-distally (1.5 × as long as terminal segment), and with one seta postero-distally, which is also pappose and 2.5 × as long as terminal segment. Terminal segment with three setae and aesthetasc. Two setae (one of which accompany the aesthetasc) subequally long and about as long as all four endopodal segments combined, while the third one being about half as long. Aesthetasc 3.3 × as long as terminal segment. Length ratio of five segments 3.5:3:1:2.5:1.1. Anterior margin of first and third endopodal segments with row of hairs. Some bunches of hairs also visible on posterior ends of both first and second endopodal segments.

Antenna (Fig. 16) 4-segmented. Exopodite long, reaching distal claws. Second segment with one long, pappose seta posteriorly which exceeds the middle of second endopodal segment. Third segment with one pappose seta and aesthetasc situated postero-medially, of subequal length. Same segment antero-medially with only one seta, which almost reaches the distal end of same segment, smooth. Penultimate segment also with one pappose seta situated postero-distally and reaching distal end of terminal segment. Terminal segment with 3 claws of subequal length, 2.4 × as long as same segment. Length:width ratio of penultimate segment 4.1:1. Length ratios of three endopodal segments 1.3:5.5:1. Some stiff hairs visible antero-distally on first and second segments. Several bunches of hairs visible postero-distally on second segment, postero-proximally, antero-proximally and antero-distally on penultimate segment.

Mandibula (Fig. 23). Coxa with about seven teeth. Exopodite with four setae. First and second segments of Mandibular palp with one seta each situated intero-distally. Third segment with two setae situated externally and one seta intero-distally. Fourth segment with three setae distally (Fig. 24). All setae smooth. Length ratios of four segments of mandibular palp equal 10:5:5:1.

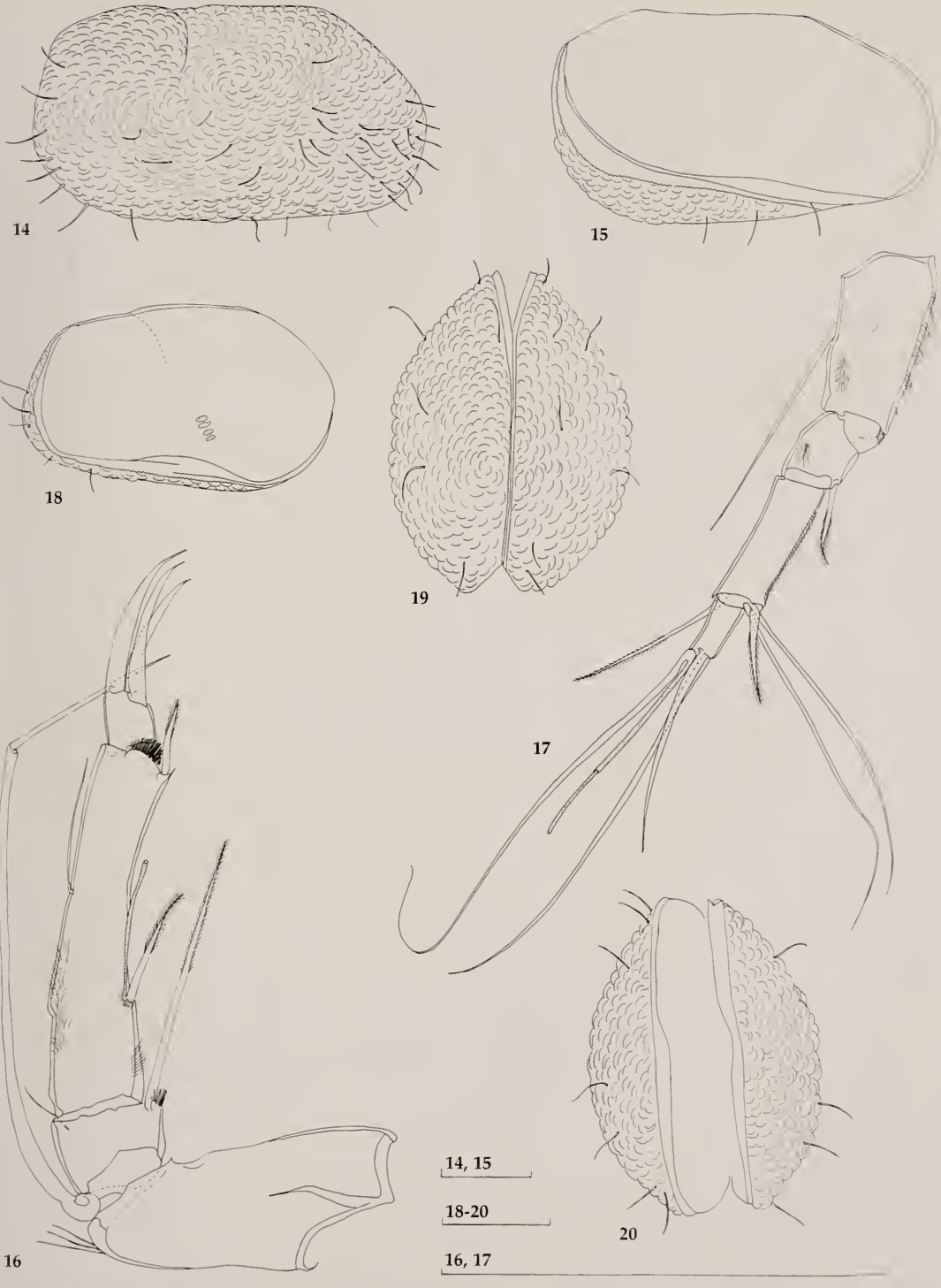
Maxillula. Branchial plate with one aberrant seta, and about 11 pappose long setae. Maxillular palp (Fig. 25) with just one segment, distally with two long pappose setae and one short and smooth seta positioned laterally.

First walking leg (Fig. 30). Protopodite with two setae (one being pappose) antero-proximally, two pappose setae antero-distally, and one pappose seta postero-proximally. First endopodal segment with one pappose seta antero-distally (almost reaching distal end of second endopodal segment). Terminal claw with one thin seta posteriorly. Claw being 1.5 × as long as terminal segment. Length ratios of three endopodal segments equal 1.8:1:1.

Second walking leg (Fig. 29). Protopodite with three pappose setae anteriorly, and one pappose seta posteriorly. Second segment with one pappose seta antero-distally, which almost reaches the distal end of following segment. Following segment, as well as terminal one without setae. Terminal segment distally with row of hairs. Terminal claw with one thin seta posteriorly. Same claw being 1.4 × as long as terminal segment. Length ratio of three endopodal segments 2:1:1.

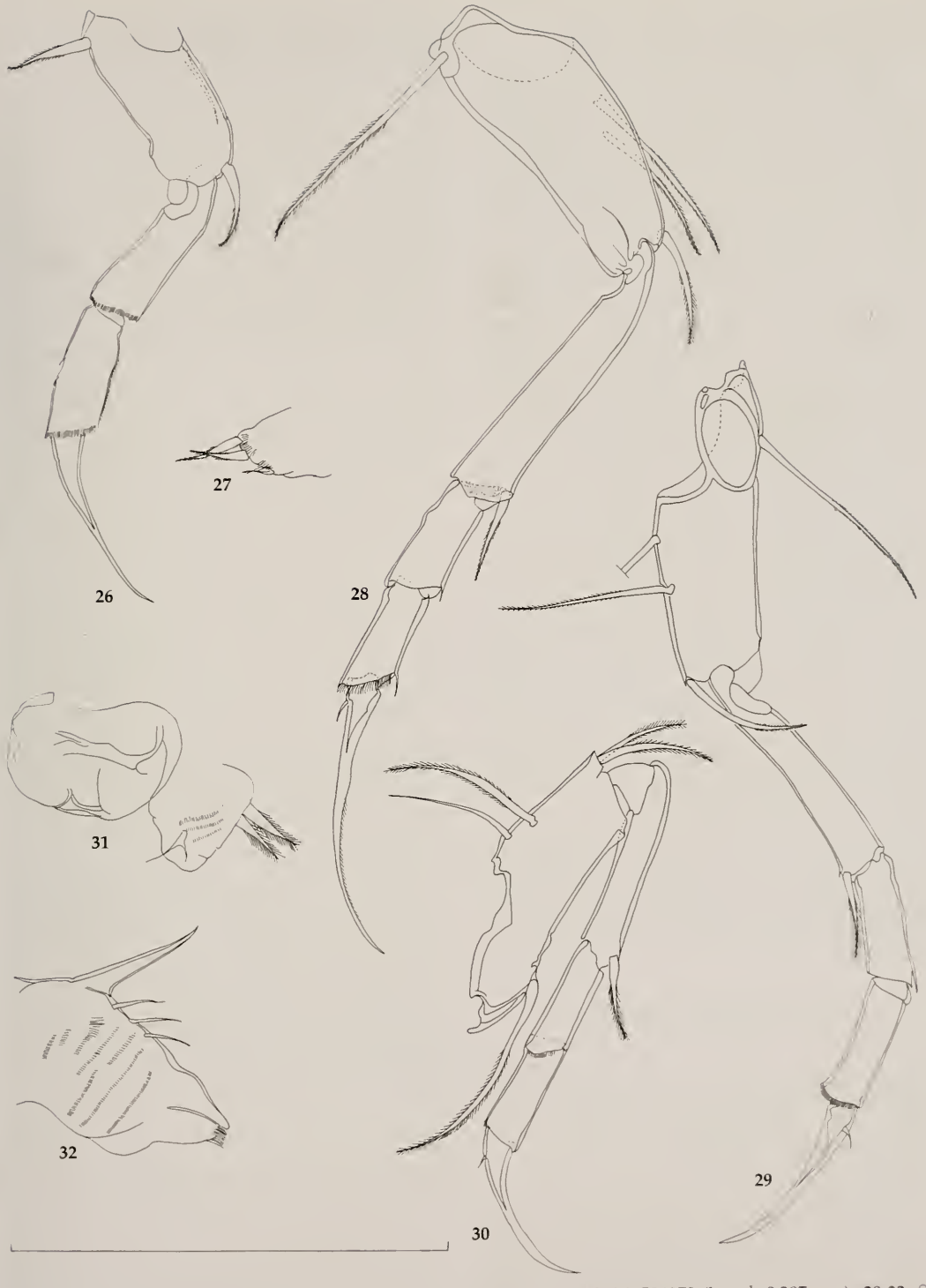
Third walking leg (Fig. 28). Protopodite with three pappose setae anteriorly and one pappose seta posteriorly. First endopodal segment with one pappose seta antero-distally, not reaching distal end of following segment. Terminal claw with one thin seta posteriorly. Same claw 2.4 × as long as terminal segment. Claw slightly serrated. Distal margins of first and third endopodal segments with row of hairs. Length ratio of three endopodal segments 2.6:1:1.

Furca (Fig. 31). As in other representatives of genus: with two distinct lobes and one smaller lobe, dilated basally.



Figs 14-20. *Kovalenskiella rudjakovi* (Danielopol, 1969). **14-17.** ♀, WAM C 28372 (length 0.434 mm). **18-19.** Juvenile, WAM C28373 (length 0.287 mm). **14.** Right valve, external view. **15.** Left valve, internal view. **16.** Antenna. **17.** Antennula. **18.** Left valve, internal view. **19.** Carapace, dorsal view. **20.** Carapace, ventral view. Scales = 0.1 mm.

Figs 21-25. *Kovalenskiella rudjakovi* (Danielopol, 1969). **21-22.** Juvenile, WAM C28373 (length 0.287 mm). **23-24.** ♀, WAM C28372 (length 0.434 mm). **21.** Maxillula. **22.** Antenna. **23.** Mandibula. **24.** Terminal segment of mandibular palp. **25.** Maxillular palp. Scales = 0.1 mm.



Figs. 26-32. *Kovalenskiella rudjakovi* (Danielopol, 1970). **26-27.** Juvenile, WAM C28373 (length 0.287 mm). **28-32.** ♀, WAM 28372 (length 0.434 mm). **26.** Third walking leg. **27.** Furca. **28.** Third walking leg. **29.** Second walking leg. **30.** First walking leg. **31.** Furca. **32.** End of the body. Scale=0.1 mm.

Caudal end (Fig. 32) with one claw-like extension, few thorns and several rows of spines.

Male. Not known.

Juvenile female. Length about 0.287 mm. Carapace (Fig. 18, 19) with clearly wider anterior end than in adult female. Anterior seta on antenna (Fig. 22) much shorter than in adult. Third walking leg 3-segmented (Fig. 26). All appendages with more stocky appearance than in adult, otherwise number of setae on all appendages same as in adult. Furca (Fig. 27) with all lobes developed.

Variability. According to the drawings provided by Rudjakov (1963), the juvenile specimen from Transcaucasia has only three setae on the fourth antennular segment. Later Danielopol (1970) found one very similar species in Romania, which he designated as *Cordocythere* n. sp. The main difference between this species and *K. rudjakovi* is, according to Danielopol (1970), the presence of four instead of three setae on the penultimate segment on antennula. All our specimens have four setae on the same segment, and we assume that Rudjakov (1963), having just juveniles, maybe overlooked one seta (which is indeed thin). Rudjakov (1963) collected altogether 5 juveniles and it must be pointed out that at least the illustrated juvenile was probably just on the last instar, because the third walking leg was 4-segmented, and the specimen was about 0.38 mm long. Other specimens collected in Transcaucasia were smaller and there are no data about their morphology. The only juvenile specimen collected in Greece is one of the lower instars, because it has 3-segmented third walking leg (Fig. 26), and is much smaller (0.287 mm) comparing with adult.

Distribution. *Kovalenskiella rudjakovi* is known from the karstic areas of Transcaucasia (Rudjakov 1963) and Romania (Danielopol 1970), as well as from two wells on the island of Lesbos (present records).

Kovalenskiella dani, spec. nov.

Figs 33-48

Types. Holotype: ovigerous ♀ (WAM C28375), from a nameless freshwater well in the village of Petra, Lesbos, Greece, July 28, 1982, collected by G. L. Pesce. – Paratype, a juvenile ♀ (WAM C28376), same data.

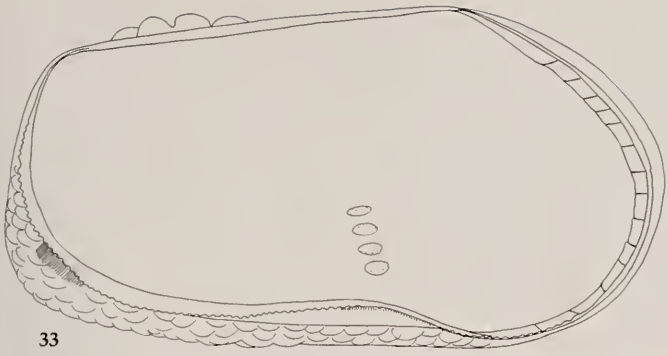
Description

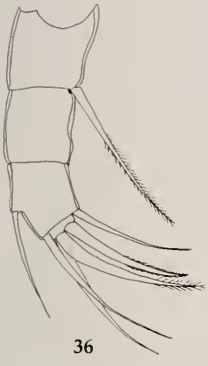
Holotype (female). Length 0.33 mm. Greatest height situated on last third, equalling 52 % of length. Greatest width about 60 % of length. Dorsal margin straight on all its length, then with almost right angle passing into posterior margin, while evenly rounded towards anterior margin. Also, dorsal margin slightly inclined towards posterior end. Hump visible depending on position of valves. Anterior and posterior margins rounded, but anterior margin more evenly. Ventral margin slightly concave around mouth region. Clear flange developed anteriorly on left valve. Selvage serrated on posterior and ventral ends, placed inwardly. Line of fusion short and with straight canals. Marginal zone not recognizable due to strong decalcification of carapace. Four muscle scars present. Hinge inverse lophodont. Surface strongly ornamented, typically for the genus, and with one sulcus medially. Surface also covered with spine-like setae.

Antennula (Fig. 43) 6-segmented. First segment without any seta. Second segment with one pappose seta more postero-proximally. Third segment with one pappose seta antero-distally (this seta reaching middle of penultimate segment). Fourth segment with one pappose seta antero-distally, which reaches the middle of terminal segment. Penultimate segment with altogether four setae: one smooth postero-distally (3× as long as terminal segment), two pappose antero-distally (one short and 1.5× as long as terminal segment, the other long and almost 5× as long as same segment), and one smooth antero-distally (just slightly longer than short pappose seta). Terminal segment with three smooth setae and aesthetasc. Seta which accompany aesthetasc being longest and 8× as long as terminal segment, the anterior one being about 6.5× as long as terminal segment, while the shortest one about 3× as long as same segment. Aesthetasc being about 3× as long as terminal segment. Length ratios of six antennular segments equal 3.7:3.3:1.28:1:1.5:1.1. Anterior margins of all endopodal segments with row of hairs.

Antenna (Fig. 45) 4-segmented. Exopodite almost reaching distal end of claws. Second segment with one pappose seta posteriorly, which exceeds middle length of following segment. Penultimate segment with one seta antero-medially which not reaching distal end of same segment, two setae (of which one aesthetasc) postero-medially, and one pappose seta postero-distally (about 2× longer than terminal segment). Terminal segment with three claws, of about same length and being 3× longer than terminal segment. Length : width ratio of penultimate segment 2.75:1. Length ratios of three endopodal segments as follows 1.3:5:1. Bunches of hairs visible on anterior margins of first three segments.

Mandibular palp (Fig. 36) with one pappose seta on first segment intero-distally, following segment without any seta; penultimate segment with one seta extero-medially, one seta extero-distally, and one seta intero-distally. Terminal segment with three strong and more claw-like setae, two of them





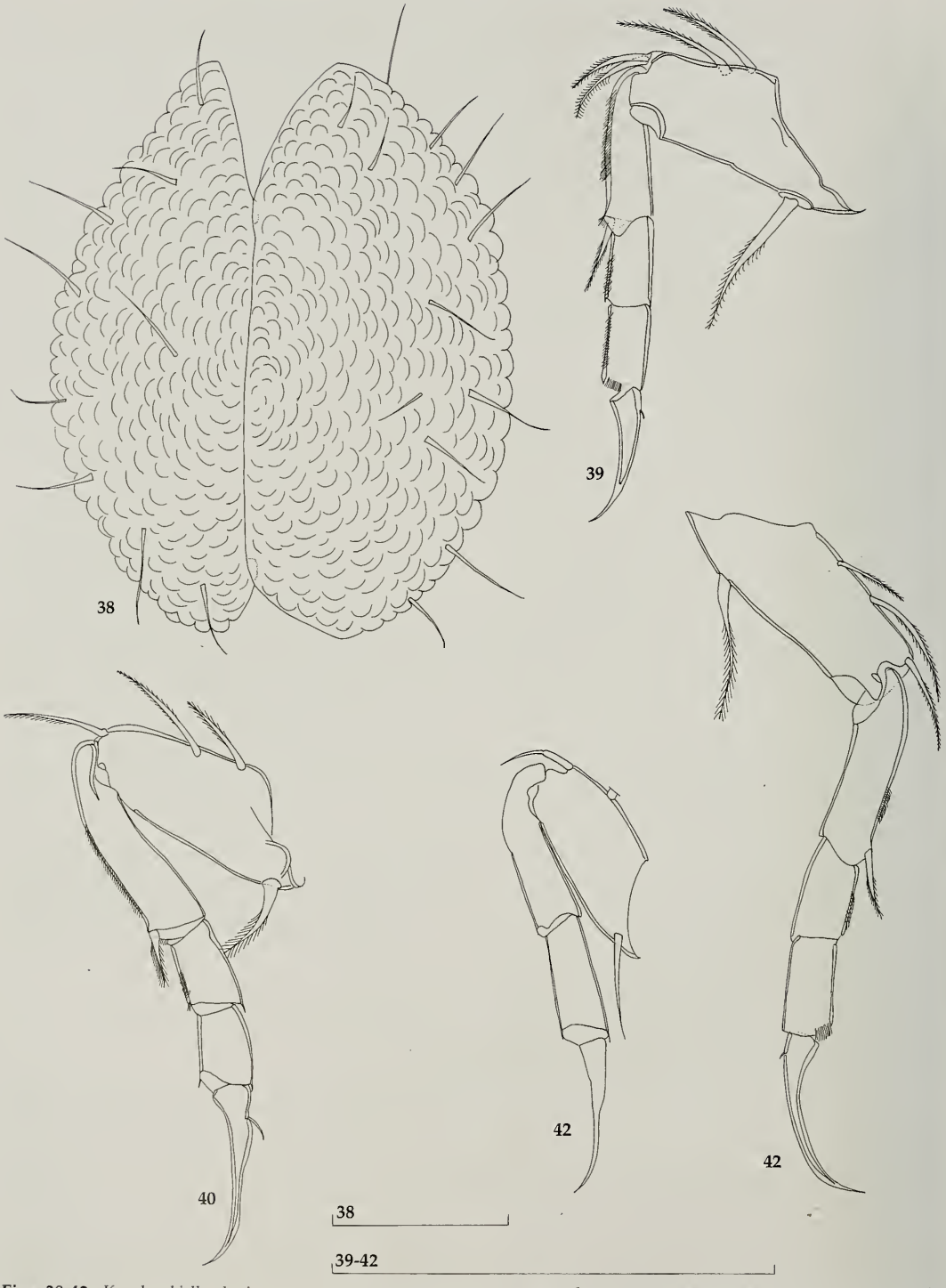
33-35

36-37

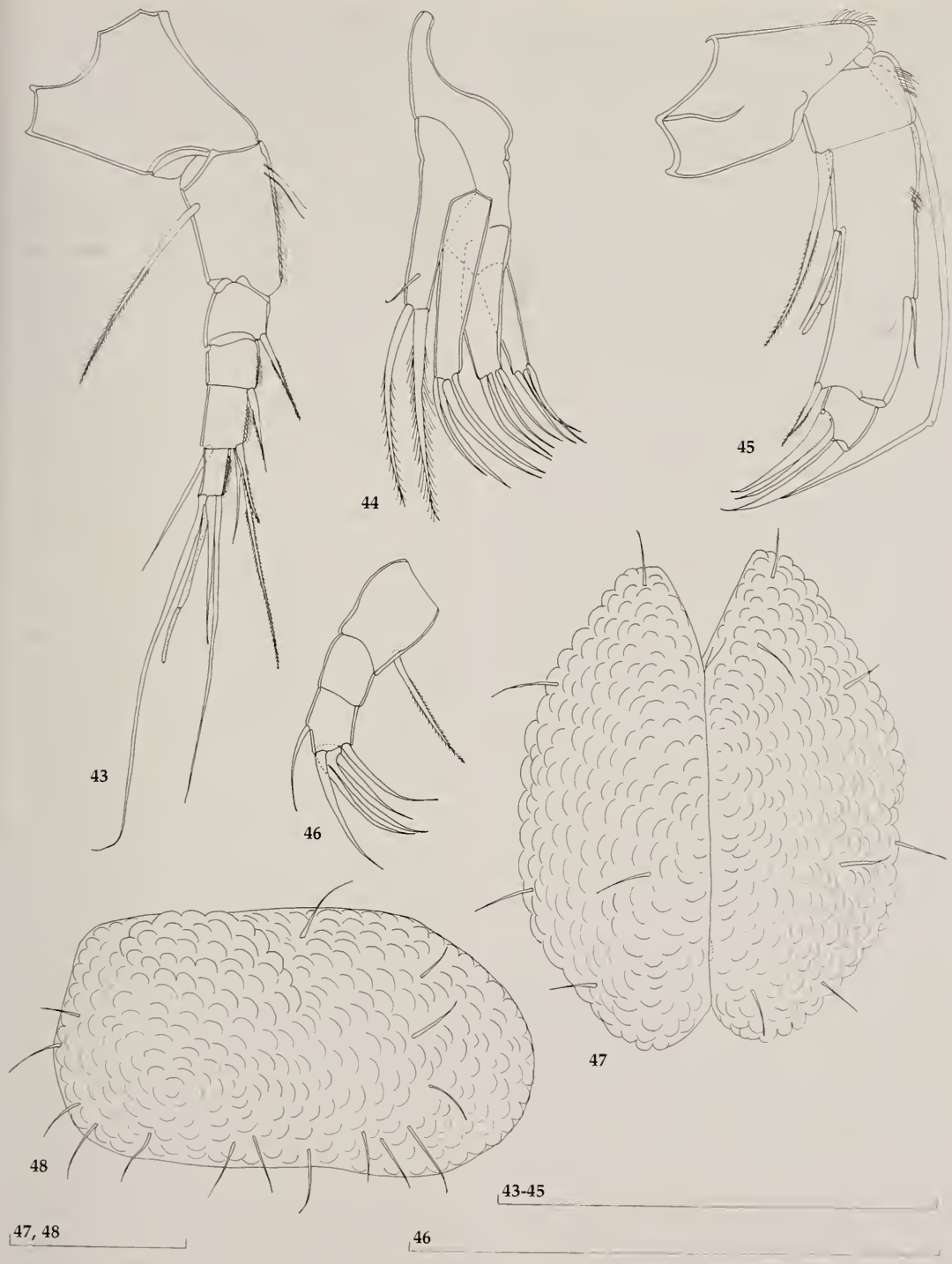
Figs 33-37. *Kovalenskiella dani*, spec. nov. Holotype, ♀ (length 0.33 mm). **33.** Left valve, internal view. **34.** Left valve, external view. **35.** Right valve, external view. **36.** Mandibular palp. **37.** Furca. Scales = 0.1 mm.

being pappose. Exopodite on Mandibula with four setae.

Maxillula with aberrant seta on branchiale plate. Maxillular palp (Fig. 44) distally with two pappose setae, and one additional inserted more laterally. Third and second endites with about four claw-like setae, first with three setae visible. All endites elongated.



Figs 38-42. *Kovalenskiella dani*, spec. nov. **38-41**. Holotype, ♀ (length 0.33 mm). **42**. Paratype, juvenile (length 0.267 mm). **38**. Carapace, dorsal view. **39**. First walking leg. **40**. Third walking leg. **41**. Second walking leg. **42**. Third walking leg. Scales = 0.1 mm.



Figs 43-48. *Kovalenskiella dani*, spec. nov. **43-45.** Holotype, ♀ (length 0.33 mm). **46-48.** Paratype, juvenile (length 0.267 mm). **43.** Antennula. **44.** Maxillula, detail. **45.** Antenna. **46.** Mandibular palp. **47.** Carapace, dorsal view. **48.** Right valve, external view. Scales = 0.1 mm.

First walking leg (Fig. 39). Protopodite with four pappose setae anteriorly, and one pappose seta posteriorly. First endopodal segment with one pappose seta antero-distally (which reaches the distal end of following segment). Terminal claw with very short seta posteriorly. Same claw 1.6× as long as terminal segment. Length ratios of three endopodal segments 1.8:1:1. Anterior margin of all endopodal segments with rows of hairs.

Second walking leg (Fig. 41). Protopodite with three pappose setae anteriorly, and one pappose seta posteriorly. First endopodal segment with pappose seta antero-distally which not reach the distal end of following segment. Terminal claw with one small, thin seta posteriorly. Same claw 1.8× as long as terminal segment. Length ratios of three endopodal segments 2:1:1.

Third walking leg (Fig. 40) with three pappose setae anteriorly, and one pappose seta posteriorly on protopodite. First endopodal segment with one short, pappose seta antero-distally (not reaching distal end of following segment). Terminal claw quite long, 2.35× as long as terminal segment. Same claw posteriorly with one small, thin seta. Length ratios of three endopodal segments 2.6:1:1. Anterior margins of first and second endopodal segments with rows of hairs. All walking legs with stocky appearance of third and fourth segments, especially on third walking leg. Third walking leg just slightly bigger than second one.

Furca (Fig. 37) with two lobes clearly visible, while additional furcal lobe, typical for genus, not observed.

Paratype (juvenile). Carapace (Figs 47-48) smaller than in adult, 0.267 mm. Penultimate segment on third walking leg (Fig. 42) undivided, but otherwise all other appendages same as in adult ♀.
Male. Not known.

Etymology. The species is named in honour to Dr. Dan L. Danielopol from the Limnological Institute of Vienna, as an acknowledgment for his great contribution to the taxonomy and evolution of the genus *Kovalenskiella*. The name is an adjective, agreeing with the feminine gender of the genus.

Distribution. *Kovalenskiella dani*, spec. nov. is known only from the type locality.

Key to recent species of the genus *Kovalenskiella* Klein, 1963

1. Antennula 5-segmented ..... *rudjakovi* (Danielopol, 1969)
– Antennula 6-segmented ..... 2.
2. Second segment of mandibular palp without any seta ..... *dani*, spec. nov.
– Same segment with 1 seta ..... 3.
3. Antenna on second segment with 2 setae antero-medially ..... *bulgarica* (Danielopol, 1970)
– Antenna on same segment with 1 seta ..... 4.
4. Fourth segment of antennula with 2 setae posteriorly ..... *cvetkovi* (Danielopol, 1969)
– Fourth segment of antennula with 1 seta posteriorly ..... *phreaticola* (Danielopol, 1965)

Discussion

Kovalenskiella dani, spec. nov. differs from all the other known species of the genus by the chaetotaxy of the mandibula, i.e. the absence of any setae on the inner side of the second segment of the mandibular palp, and by the presence of two setae externally on the penultimate segment of the same appendage. By its developed flange on the anterior end of the left valve, the new species is very closely related to *K. phreaticola* (Danielopol, 1965), described from Romania (Danielopol, 1965). On the other side, the presence of just two setae externally on the penultimate segment of the mandibular palp relates it closely to *K. rudjakovi* (Danielopol, 1969) which, however, differs from all other living *Kovalenskiella* species by having a 5-segmented antennula.

One of our specimens of *K. bulgarica* (Danielopol, 1970) has two setae on the fourth segment of one antennula, which is actually a character of *K. cvetkovi* (Danielopol, 1969). This is not noticed in the other specimen, nor on the opposite antennula of the same aberrant specimen. The presence of two setae anteriorly on the antenna in *K. bulgarica* still clearly separates this species from *K. cvetkovi*, which has one seta at this position. The mentioned variability increases the confusion in the taxonomy of the genus (see further discussion), where chaetotaxy of antennula, antenna, and mandibula are almost the only distinguishing features for the living species. If further investigations of the *Kovalenskiella* species would show even greater variability in the chaetotaxy, then, unfortunately, the specific status of some species may become questionable.

The whole genus *Kovalenskiella* Klein, 1963 has a characteristic appearance of the carapace, both in dorsal and lateral views, as noticed by Danielopol (1970). For this reason, fossil species are not included in the key to the species, provided above. Among fossil species, two can be distinguished from the rest of the known species by markedly developed caudal processions on the carapace that are spine

like and visible when observed from lateral side. Those are: *Kovalenskiella caudata* (Lutz, 1965) and *K. prima* (Carbonnel & Ritzkowsi, 1969). The first species was described from Miocene freshwater deposits in southern Germany (Lutz 1965), while the former was described from Oligocene lake deposits in northern Germany (Carbonnel & Ritzkowski, 1969). The appearance of *K. caudata* incredibly reminds one of that of *Frambocythere tumiensis* (Helmdach, 1978) which is the type species of the genus *Frambocythere* Colin, 1980, and it is found in Cretaceous deposits of northern Spain and France (see Colin & Danielopol 1980). The main feature which distinguishes the genus *Frambocythere* from *Kovalenskiella* is the presence of two sulci on the carapace in the former, whereas *Kovalenskiella* species have only one sulcus. Lutz (1965) in the description of *K. caudata* stated that it has only one sulcus on the valves, but on his figure 27/a there are clearly two sulci indicated.

This may indicate that *K. caudata* actually belongs to the genus *Frambocythere*. In the species *K. prima* an additional sulcus is not visible. Although Carbonnel & Ritzkowski (1969) mentioned in their description that this species possesses two spines postero-ventrally, this feature is not as markedly developed as in *K. caudata*. Mostafawi (1994) described *K. euboeanensis* Mostafawi, 1994 from Upper Plicene freshwater deposites of Euboa Island (Greece). This species has tubercles (one bigger, other smaller) postero-caudally that are much duller and not as markedly developed as in the species mentioned above. Clearly, according to other features of the carapace (one sulcus, and characteristically ornamented carapace), this species belongs to the genus *Kovalenskiella*. Colin & Danielopol (1980) reported one undescribed species from the same island, which may be the same that Mostafawi (1994) described. Also Colin & Danielopol (1980) and Danielopol (1976, 1980) mentioned three undescribed species of the genus *Kovalenskiella:* one each from Romania (Colin & Danielopol 1980, pl. 1), northern Italy (Colin & Danielopol 1980, pl. 5, figs 10-11), and Austria (Danielopol 1976, Danielopol 1980, fig. 2. A-B). The Romanian species differs from the Italian one by having a developed flange on both valves (see Colin & Danielopol, tab. 1). This feature is not known in the Austrian species, which is however probably the same as the Italian one. From all those species only the carapace was collected and mainly in interstitial waters. Although Colin & Danielopol (1980) and Danielopol (1980) suspect that they are recent species this can hardly be proven, and they will remain unnamed until further details of their morphology can be provided.

All those species also have developed turbercles postero-ventrally, as seen in *K. phreaticola, K. cvetkovi* and *K. bulgarica* (see Colin & Danielopol 1980). In the new species tubercles were not recorded, but our specimens of *K. dani* have completely decalcified carapace, so this cannot be claimed with complete certainty. The last fossil species, and the type-species of the genus, *Kovalneskiella turianensis* Klein, 1963 was described from Pliocene deposits of Azerbaijan (town of Baku on the Caspian Sea) (Klein 1963). The subspecies *K. turianensis praeturiensis* Vekua (1975), was recorded from Pliocene deposits in Tuapse (Russian Federation) which is on the shore of the Black Sea. The type species lacks any tubercules postero-ventrally, like *K. rudjakovi* (Danielopol, 1969). The locations of both subspecies (especially the second one) are relatively close to the locality from which *K. rudjakovi* was described, i.e. the town of Kutaisi (Transcaucasia). This was pointed out by Colin & Danielopol (1980) who also doubted the age of deposits where subspecies *praeturiensis* was found (they suspected that the species actually origins from younger deposits). *K. rudjakovi* now has a wider distribution than previously thought, as we found it in Greece and assigned to it some unnamed specimens from Romania (see synonymy for this species). *K. rudjakovi* may be a younger synonym of *K. turianensis*, especially if Colin & Danielopol (1980) were right in doubting the age of deposits. As with many ostracod fossils, these questions remains unresolved due to the great similarities in shape of carapace with recent species. In many such cases it can be claimed with great probability that they belong to the same genus, and if the ages of deposits are sufficiently different we may have the case of separate species. Genera like *Kovalenskiella*, where all species have almost identical carapace appearance, are an example of the difficulties that both zoologists and palaeontologists have when identifying species.

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